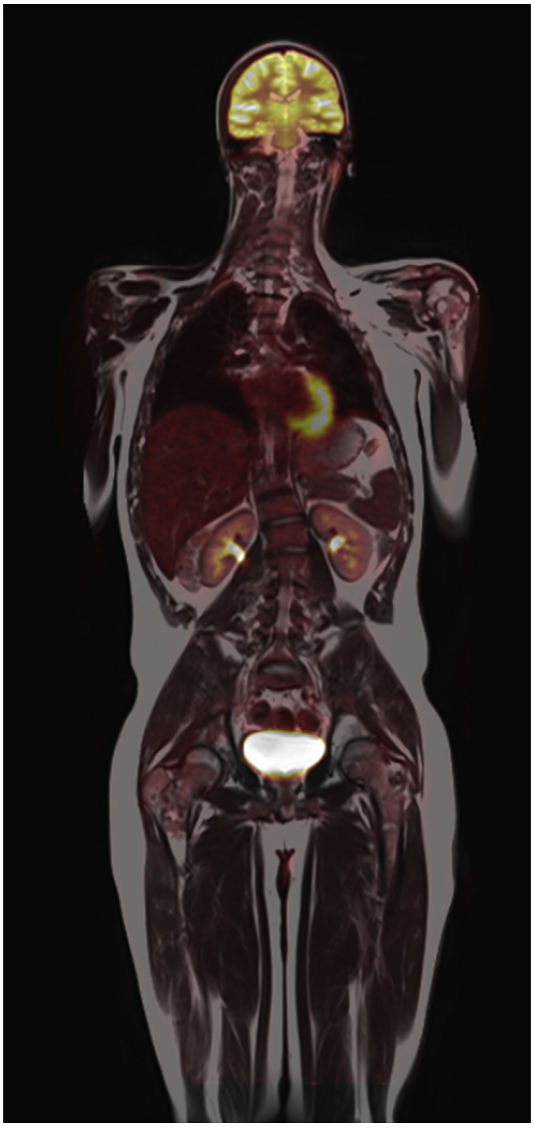
references to motion correction, quantification, and registration artifacts. Various PET/MRI protocols, with particular attention to MSK pathology and the use of advanced MR techniques (e.g. WB DWI and WB STIR) will be discussed. Various case examples, including its potential benefit in the initial assessment of multiple myeloma, bone and soft tissue tumors, its value in restaging in MSK tumors, and its potential role in therapy response assessment will be introduced. While FDG is the most common radionuclide used today, the possibility of using this architecture in the era of personalized medicine, with development of targeted tracers and receptor-specific tagged antibodies linked to various radionuclides will be explored.



Whole body PET/MRI FDG image demonstrated successfully treated bone lymphoma.

Brief CV
Research Area(s): BMD/osteoporosis/orthopedic applications, MRI sequences, Informatics, MSK imaging
Technical Expertise: MRI, CT, US,MSK biopsies and procedures
Email: richmob@ccf.org

MULTIMODAL IMAGING OF EXPERIMENTAL BONE METASTASIS

Tobias Baeuerle
University Medical Center Erlangen, Institute of Radiology, Erlangen, Germany

Bone is among the most common locations of metastasis and therefore represents an important target for diagnostic imaging in cancer patients as well as in preclinical research. Non-invasive imaging modalities monitor molecular, functional and morphologic changes in both compartments of these skeletal lesions — the bone and the soft tissue tumor compartment. In the bone compartment, morphologic information on skeletal destruction is assessed by computed tomography (CT) and radiography. Pathogenic processes of osteoclast and osteoblast activity, however, can be imaged using optical imaging, positron emission tomography (PET), single photon emission CT (SPECT) and skeletal scintigraphy. Accordingly, conventional magnetic resonance imaging (MRI), ultrasound and CT as well as diffusion-weighted MRI and optical imaging are used to assess morphologic aspects on the macroscopic and cellular level of the soft tissue tumor compartment. Imaging methods such as PET, dynamic contrast-enhanced techniques and vessel size imaging further elucidate on pathogenic processes in this compartment including information on metabolism and vascularization. By monitoring these aspects in bone lesions, new insights in the pathogenesis of skeletal metastases can be gained when complementary information from multimodal imaging is combined. This talk summarizes emerging and established imaging techniques in experimental bone metastasis for the assessment of tumor and bone cell activity including molecular, functional and morphological aspects. Finally, the translation of multimodal imaging techniques of skeletal lesions into the clinical situation is demonstrated for cancer patients.

Brief CV
Research Area: Clinical and experimental imaging of malignant bone lesions using different modalities
Technical Expertise: Magnetic Resonance Imaging, Computed Tomography, Ultrasound, Positron Emission Tomography
Email: tobias.baeuerle@uk-erlangen.de
Website: http://www.radiologie.uk-erlangen.de/en/

VIRTUAL REALITY BASED SURGICAL SIMULATION

Pheng Ann Heng
Department of Computer Science & Engineering, The Chinese University of Hong Kong, Hong Kong

The main focus of surgical simulation is to develop and deliver virtual reality based training and computer enhanced learning in surgery. Traditionally, medical students learn diagnostic, therapeutic and surgical skills through difficult clinical training on patients. Advanced technologies such as virtual reality and visualization can help to make the surgical training process more efficient, engaging and flexible. It is possible to construct immersive virtual environments to provide realistic visualization and dexterous haptic feedbacks for surgical training. In this talk, I would introduce related virtual

reality techniques for surgical simulation and to share our experience in developing several virtual reality based surgical simulators.

Brief CV
Research Area(s): Medical Imaging and Visualization, Surgical Simulation
Technical Expertise: Computer Graphics, Visualization, and Virtual Reality
Email: pheng@cse.cuhk.edu.hk
Website: http://www.cse.cuhk.edu.hk

Dr. Heng received his B.Sc in computer science in 1985 from the National University of Singapore. He received his M.Sc in computer science, M.A. in applied mathematics, and Ph.D. in computer science all from Indiana University (Bloomington, USA) in 1987, 1988, and 1992 respectively. From 1992 to 1995, he joined the ISS-JHU Center for Information-enhanced Medicine (CIeMed) at the National University of Singapore as a research associate. He later joined The Chinese University of Hong Kong in 1995 as an assistant professor and he was promoted to the rank of full professor in 2002. He is currently the Chairman of the Department of Computer Science and Engineering at CUHK.
He has served as the founding Director of Virtual Reality, Visualization and Imaging Research Centre at CUHK since 1999 and as the founding Director of Centre for Human-Computer Interaction at Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences since 2006. He has been appointed as a Cheung Kong Scholar Chair Professor by the Ministry of Education, People Republic of China in 2007, and he currently holds several visiting professorships at various well-known universities in Mainland China. He received the IEEE Transactions on Multimedia Prize Paper Award in 2005.
His research interests include virtual reality applications in medicine, visualization, medical imaging, human-computer interaction, and computer graphics. He has published over 350 publications and received over HK$40 million funding support in these research areas.

THE IMAGING OF BONE TUMORS — THE FINE PRINT

Shekhar Madhukar Kumta, S. K. C. Wong
Department of Orthopaedics & Traumatology, The Chinese University of Hong Kong, Hong Kong

While numerous advances have been made in the techniques of diagnostic imaging for musculoskeletal neoplasms, the exact delineation of the boundary between normal and neoplastic tissues hitherto remains a matter left to the judgment of experts. Often this is a best-guess compromise with safety concerns leading to an overestimation of resection margins. Even amongst experts there is often debate and disagreement as to whether tissues that show activity on numerous functional imaging studies in a particular patient represent reactive tissue adjacent to the neoplasm or whether they are part of the neoplasm and contain malignant cells. These uncertainties have recently come to the fore with the advent of precision surgery — particularly in the case of pediatric bone lesions — where a paradigm shift in resection philosophy has resulted in joint sparing re-sections with very precise margins and with outstanding functional results.
Conventional high resolution CT and MRI are routinely performed for assessing the anatomic extent of a lesion in bone. However very often post-processing of imaging using free and commercially available software is absolutely essential for the clinicians to make a safe judgment regarding the extent of oncological disease. Post processing may often require image resampling alogorithms and the ability to fuse multiple functional and structural modalities of imaging provides a robust platform for clinicians to make safe judgments.
In the near future, we hope molecular and nano-molecular imaging may greatly facilitate the delineation between what is normal and that which is neoplastic making precision resection surgery widely applicable.

Brief CV
Research Area(s):
1. Bone Cancer — Musculoskeletal Oncology
2. Complex Extremity Reconstruction & Limb Salvage Surgery
3. Molecular Biology of Giant Cell Tumors
4. Osteolytic Neoplasms
5. Palliative Surgical Care

Technical Expertise:
1. Bone Tumor Surgery and Complex Limb Salvage Reconstruction
2. Surgery for Advanced Sarcomas and Metastatic Cancer

Email: kumta@cuhk.edu.hk
Website: http://www.ort.cuhk.edu.hk/e/about_us/au_staff.asp